



Communications

Extended Range RFID and Sensor Tag

An energy-efficient method for increasing the range of SAW RF tags for passive RFID and sensor systems

NASA's Johnson Space Center has developed a novel technology that enhances the performance of surface acoustic wave radio frequency (SAW RF) tags for passive radio frequency identification (RFID) and sensor applications. This innovation significantly extends operational range without necessitating additional transmit power. Conversely, it can reduce transmit power requirements for shorter range passive RFID systems. The inherent temperature-and pressure-sensitive qualities of the SAW RF components also render this device ideal for remote sensing applications.

BENEFITS

- ➔ Extended range: effectively scales the operational range of the sensor capabilities
- ➔ Improved accuracy: enhances range estimates and bearing angle (angle of arrival)
- ➔ High efficiency: greater range without the power increase
- ➔ Inherently rugged: operates in challenging conditions and extreme temperatures

technology solution



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THE TECHNOLOGY

This scalable technology uses a pair of phase-matched SAW RF tags coupled with a Van Atta antenna array. Typically composed of piezoelectric lithium niobate or quartz, SAW RF tags convert the interrogating signal into a surface acoustic wave, which is then encoded with the tags unique identification number as the wave encounters a series of reflectors etched in the crystal. The modulated signal then converts back to electromagnetic energy and is transmitted to the interrogator. The Van Atta antenna component receives the interrogating signal and then reflects it in the direction of its arrival. The result is passive beam-steering and tracking of the interrogator without prior knowledge of its location. The increased gain provided by the array allows for extended range or for reduced transmit power from the interrogator within shorter distances.

In its simplest form, a basic two-element building block, this technology's innovative SAW-Van Atta array combination provides a 37 percent increase in free space range over existing passive RFID technologies without need for additional power. The simplicity of the design allows users to achieve this enhanced performance using commercially available SAW crystals (no modifications required) and the array is scalable to include additional coupled elements to further increase the directionality and thus range of the system.



The NASA developed technology could be used in hospitals to track patients, or in first response situations to track personnel and assets.

APPLICATIONS

The technology has several potential applications:

- First responder - real-time location systems for first responder personnel and assets
- Medical - hospital patient tracking
- Logistics - vehicle and container tracking in harsh conditions
- Food processing - remote temperature and pressure tracking

PUBLICATIONS

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